REMARKS

Claims 9-11 are currently active.

Claims 9 and 10 have been amended. Antecedent support for these amendments is found in the figures.

The Examiner has rejected Claims 9-11 as being unpatentable over JP6-256067 in view of DiChiara.

Respectfully, the applicant suggests that the Examiner is missing several important points which will be addressed below.

The next paragraphs will clearly and in great detail explain why tapering is NOT required but without tapering the joint strength will be weaker and reproducing joints for multiple ceramic assemblies will be uncertain in strength.

The applicant still states that tapering is NOT required to achieving joining between ceramic bodies. However, the joint strength is determined by the joint thickness, the thinner the joint the stronger is the joint, **this is a fact**. So, now let's examine how one can

achieve a thin joint between cylindrical ceramic parts. The claimed invention has been limited to cylindrical parts. Consider two cases: the first is where the cylinders to be joined are of constant diameter and the second case is where the cylinders have a variable diameter as is the case with tapering.

Case 1. Constant Diameter Cylinders

The ideal gap spacing between two cylindrical ceramic parts that yields high strength joints lies between 5 and 50 μm, depending on the bonding mixture and materials. The methods for machining or fabrication of cylindrical ceramic parts are limited to a tolerance of 20-100 μm. The better the machining tolerance the more expensive and complex is the machining operation. If we consider having the best machining available (20 μm) then the outer cylinder at worst would be 20 μm too large and the inner cylinder at worst would be 20 μm too small. If we are targeting achieving a 50 μm gap then we would end up with a 90 μm gap which produces a weaker joint. The other extreme is that the gap comes out at 10 μm, which is fine for strength. For multiple assemblies, then the best machining for the easiest gap (50 μm) would create gaps ranging from 10 μm to 90 μm. So, multiple assemblies would end up with a varying range of joint strengths. This is not desirable for a manufacturing process. Clearly tapering was **NOT** required here, but non-reproducible joint strengths are the outcome due to machining limitations.

Case 2. Variable Diameter Cylinders or Tapered Cylinders

With tapering the taper angles may vary by from 5-10 degrees, the only restriction is that the male taper must have a shallower angle than the female taper. If the taper angle is not enough it is easy to re-machine the taper until the angle requirement is satisfied. Note that re-machining in the constant diameter cylinders does not improve the gap. Now for multiple assemblies then, let's say that we have mating parts with 5 degree angles and mating parts with 10 degree angles. In any taper angle case, when the parts are inserted there will always be an axial position where the part insertion process stops! Thus the gap will start at zero at that stopping position and increase to 50 μm in a distance of 572 μm for the 5 degree case. For the 10 degree taper assembly, the gap will increase to 50 μm in a distance of 284 μm. Thus both assemblies will have achieved the strongest bond strength range for gaps from 5 and 50 μm. There will still be a joint strength difference due to the fact that the different taper angles will have varying areas of 5 and 50 μm gaps, however, all tapers will have the strongest bonds and thus tapers are more suited to a manufacturing process. Clearly tapering was **NOT** required here, but tapering produces a stronger joint and produces a reproducibly strong joint.

Tapering is the key feature which controls one of the most important properties of a ceramic to ceramic joint, namely, joint thickness and hence joint strength.

Examining US patent number 6,692,597 B2 reveals by numerical referencing and by reproducing the text the following facts:

Page 2, line 28 through page 3, line 2, "The **thickness** of the pre-ceramic polymer will determine the **strength** of the **joint** as well. Therefore, tight tolerances are normally held in the joint components and even surface roughness can affect the effectiveness of the joint. Heavy machining and mirror polished **flats** are made to **reduce** the **thickness** of the joint material to create a **strong joint**."

The above text ties together joint strength and with thin joints.

Page 4, lines 14-16, "Combinations of silicon carbide bodies **10** joined by this technique require only a *close fit* with a **thin layer of the slurry 12** between them."

The lines above emphasize the need for a thin joint.

Page 6, lines 15-24, "The inclusion of capture **tapers (FIG. 2)** in the creation of the joint facilitates **stronger joints** by allowing the application of an appropriately **thin coating of slurry 12**. As shown in **FIG. 5**, where the angle of the interior body is inclined at a lesser angle than the exterior body, the slurry **12** is filled between the bodies **10**. There exists a region of **optimal thickness** where the slurry **12** is polymerized in an **optimal manner**."

Finally, tapers are associated with achieving strong joints by making thin joints.

These facts are not obvious to JP 6-256067 and DiChiara, Jr. 6,494,979 and Barton et al. 6,214,472, nor are they suggested or implied.

The Examiner has rejected Claim 9 as being unpatentable over Barton et al. in view of DiChiara, Jr. For the reasons explained above, amended Claim 9 is patentable over the applied art of record.

Accordingly, Claim 9 is patentable over the applied art of record.

In view of the foregoing remarks, it is respectfully requested that the outstanding rejections and objections to this application be reconsidered and withdrawn, and Claims 9-11, now in this application be allowed.

Respectfully submitted,

Ansel M. Schwartz, Esquire
Reg. No. 30,587
One Sterling Plaza
201 N. Craig Street
Suite 304
Pittsburgh, PA 15213
(412) 621-9222